

# Development of thyroid and parathyroid glands

## Endocrine block

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### Objectives :

- ✓ Describe the development of the thyroid & parathyroid glands.
- ✓ Describe the most common congenital anomalies of the thyroid gland.

### Resources :

- ✓ 435 embryology (males & females) lectures.
- ✓ BRS embryology Book.
- ✓ The Developing Human Clinically Oriented Embryology book.

### Color Index:

- ✓ EXTRA
- ✓ Important
- ✓ Day, Week, Month

### Team leaders :

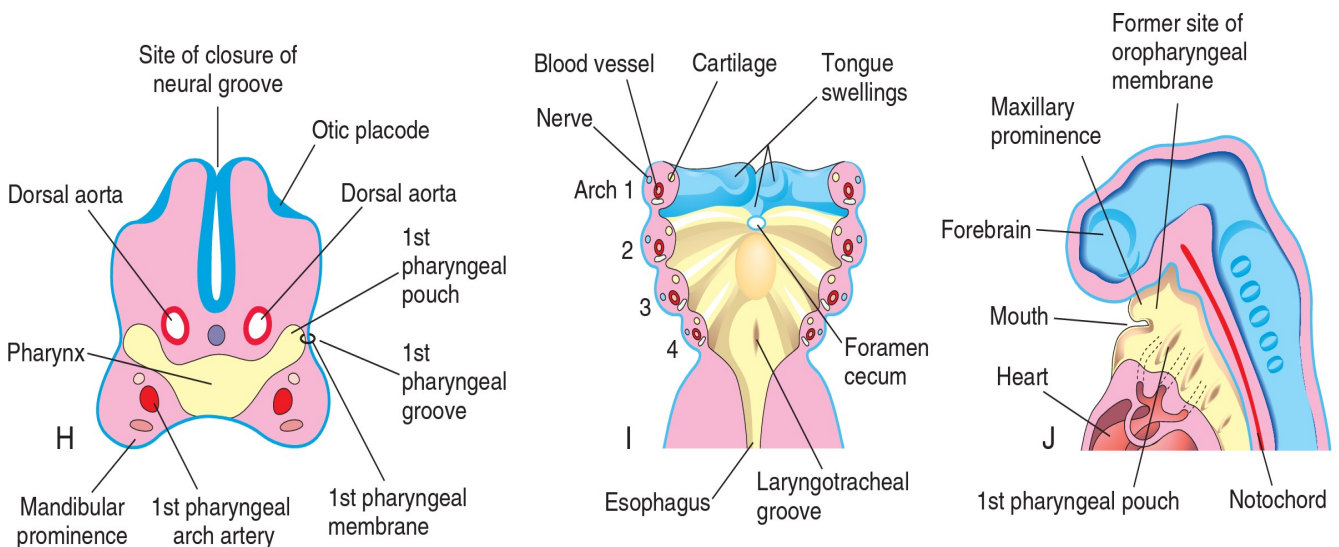
Afnan AlMalki & Helmi M AlSwerki.

[Helpful video](#) 

Revised by  
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## Pharyngeal Apparatus :

- The pharyngeal apparatus consists of the pharyngeal arches, pharyngeal pouches, pharyngeal grooves or cleft (externally) , and pharyngeal membranes (internally), all of which contribute greatly to the formation of the head and neck. (The head & neck region develops from the pharyngeal apparatus) The pharyngeal apparatus is first observed in week 4 of development and gives the embryo its distinctive appearance. There are five pharyngeal arches in **Humans** have 1, 2, 3, 4, 6 (Arch 5 does not form or regresses rapidly), four pharyngeal pouches (1, 2, 3, and 4), four pharyngeal grooves (1, 2, 3, and 4), and four pharyngeal membranes (1, 2, 3, and 4).
- The mesoderm in the head and neck regions divided into 6 cubical masses called the 6 pharyngeal or branchial arches in **embryo**.
- Each arch is formed of a Core of mesoderm , Covered externally by **ectoderm** and the space between 2 arches from **outside** is called **cleft or groove** , Each arch is lined from inside by **endoderm** and the space between the 2 arches from **inside** is called **pouch**.



### Germ Layer Derivatives



Ectoderm



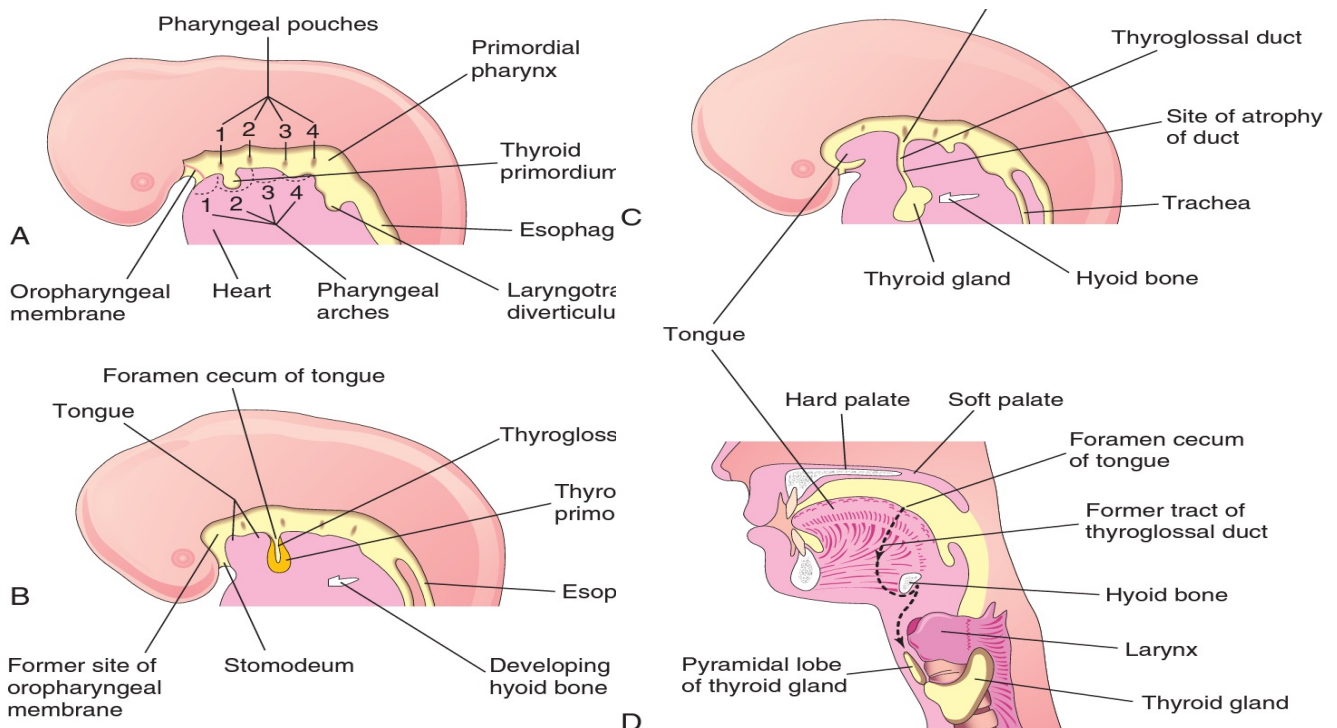
Endoderm



Mesoderm

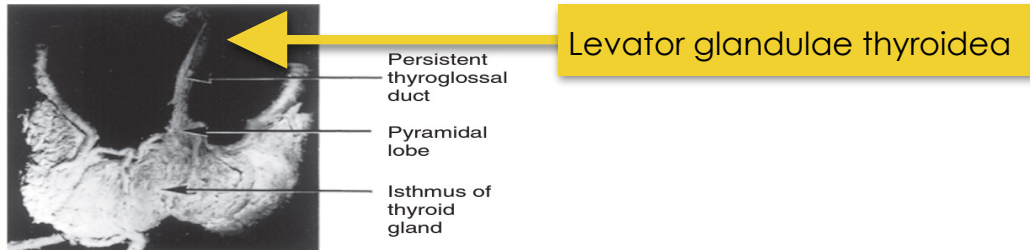
## Thyroid development :

- By the **24th day after fertilization**, the thyroid gland begins its development , It is the first endocrine gland to develop.
- It develops from the endoderm of the floor of the primitive pharynx, at the junction of the anterior 2/3rd & posterior 1/3rd of the tongue (foramen cecum). It develops from the (**Thyroid primordium** ). "Pic.A"
- As the tongue grows, the developing thyroid gland descends downward in the neck. It descends **anterior to the developing hyoid bone & laryngeal cartilages**. "Pic B,C"
- The thyroid is connected to the developing tongue by a narrow tube, called the **thyroglossal duct**. "Pic, D"
- At first the thyroid primordium is hollow, but soon it becomes solid & divided into 2 lobes and an isthmus. By **7th week (50th day )** the gland takes its **final shape & position**, and **the thyroglossal duct begins to fibroses and degenerates**.



- Its upper end of duct (The proximal opening) persists in the dorsum of the tongue as the **foramen cecum** (The site of the thyroglossal duct is indicated in the adult by the foramen cecum).

- The distal part of the duct may persist in 50% of people to form the pyramidal lobe. The pyramidal lobe may be attached to the hyoid bone by fibrous or smooth muscle; the **Levator glandulae thyroideae**.

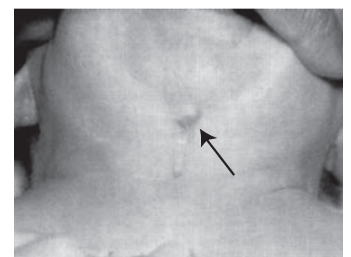
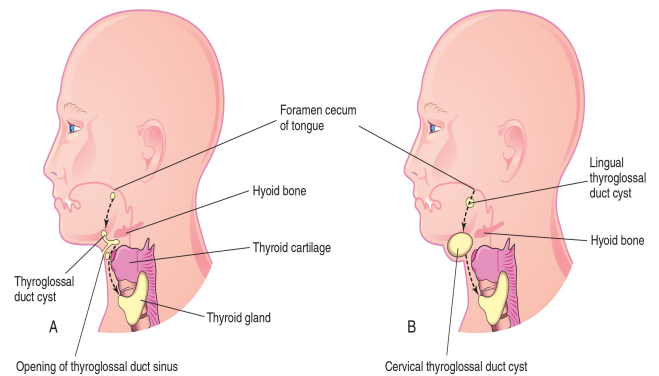


### Congenital Anomalies:

1. Congenital hypothyroidism.
2. 2-Persistence of thyroglossal duct.
3. **Thyroglossal duct cyst.**
4. **Ectopic thyroid gland.**
5. Accessory thyroid tissue.
6. Agenesis of the thyroid gland.

### Thyroglossal duct cyst:

(A) Sketch of the head and neck showing the possible locations of **thyroglossal duct cysts**. A thyroglossal duct sinus is also illustrated. The broken line indicates the course taken by the thyroglossal duct during descent of the developing thyroid gland from the foramen cecum to its final position in the anterior part of the neck. (B) Similar sketch illustrating lingual and cervical thyroglossal duct cysts. Most thyroglossal duct cysts are located just **inferior to the hyoid bone**.



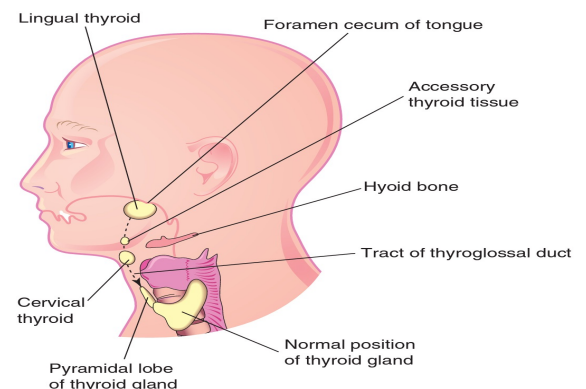
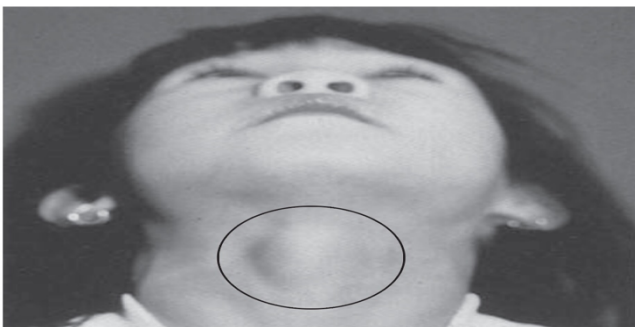
Cysts may form anywhere along the course of the thyroglossal duct. Usually, the thyroglossal duct atrophies and disappears, but a remnant of it may persist and form a cyst in the tongue or in the anterior part of the neck, usually just inferior to the hyoid bone. Figure shows a thyroglossal duct cyst (arrow), which

is one of the most frequent congenital anomalies in the neck and is found along the midline most frequently below the hyoid bone.

## ECTOPIC THYROID TISSUE

**Normally :** The thyroid glands develops high up close to foramen cecum of the developing tongue. Then it descends along the thyroglossal duct to reach its final position by the **7th week**.

**Ectopic:** Descent of the thyroid could be **arrested at any point**, or **extends down** behind the sternum in the thorax.

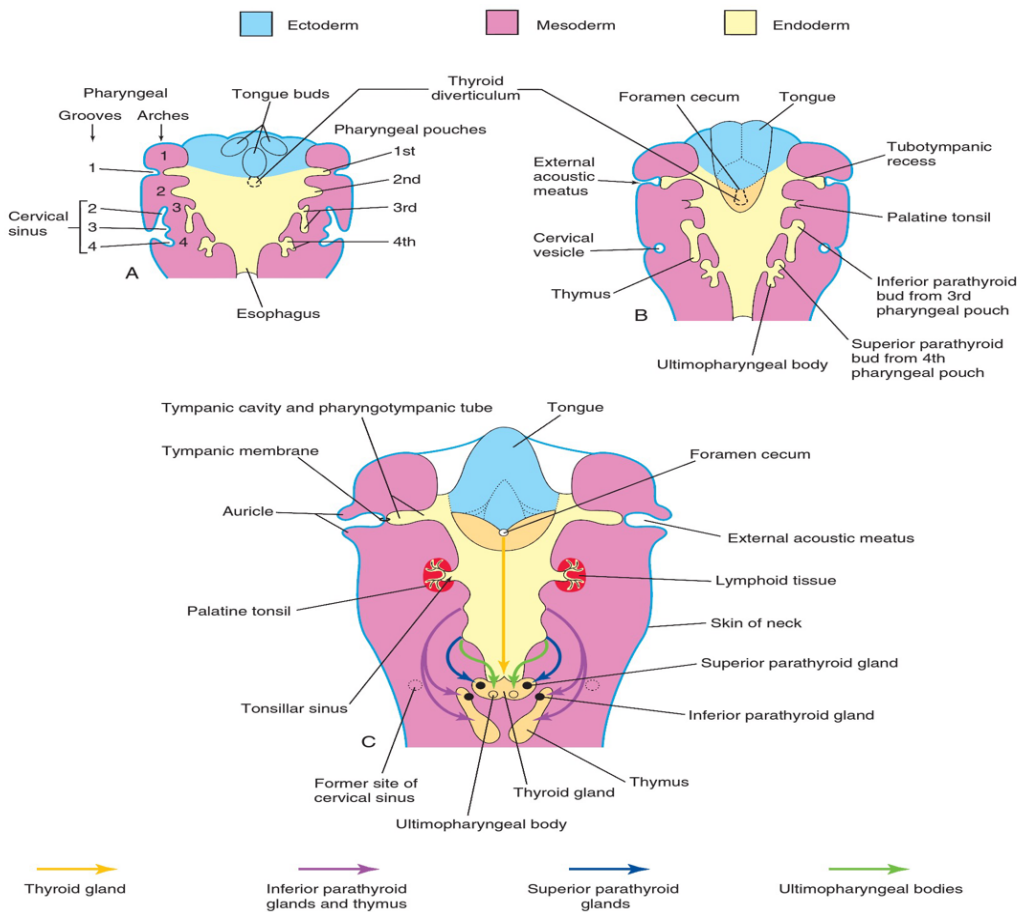


## Pharyngeal Pouches

- The pairs of pouches develop in a craniocaudal sequence between the arches internally. The first pair of pouches lies between the **first and second pharyngeal arches**.
- There are four pairs of pharyngeal pouches. The **fifth pair** of pouches is **absent or rudimentary**.
- Each of the **3rd & 4th** pharyngeal pouch develops into dorsal and ventral parts. By the **sixth week :**

	dorsal	Ventral
3rd pouch	develops into <b>inferior parathyroid bud</b>	gives the <b>thymus gland primordium</b>
4rd pouch	develops into the <b>superior parathyroid bud.</b>	forms what is called <b>Ultimopharyngeal body.</b>

- As the **thymus** primordium develops, it descends downward to the thorax, behind the sternum in superior mediastinum,
- It **draws** the **inferior parathyroid bud to a lower level than the superior parathyroid**. Both parathyroid glands lie behind the thyroid gland.



بالمختصر الانفيروبور-  
 باراثيرويد طلعت من  
 ٣ والسويبريور طلعت  
 من ٤ فلو تلاحظون  
 الشكل بيطلع غلط  
 كيف الانفيروبور فوق  
 السويبريور لان ٣  
 فوق ٤ فتجي  
 الثايمس تعدل  
 الوضع هذا في وقت  
 نموها تسحب معها  
 الانفيروبور وتوجهها  
 لوضعها الطبيعي  
 شوfo الفيديو اللي  
 بالبداية عشان  
 تتخيلون اكثر.

## Summary

- 24th day after fertilization	- the thyroid gland begins its development
- 7th week (50th day)	- the gland takes its final shape & position. - the thyroglossal duct begins to fibrose and degenerates.
- sixth week	Dorsal 3rd pouch > inferior parathyroid bud Ventral 3rd pouch > thymus gland primordium dorsal 4th pouch > superior parathyroid bud. Ventral 4th pouch > Ultimopharyngeal body.

**ECTOPIC THYROID TISSUE** : Descent of the thyroid could be **arrested at any point**, or **extends down** behind the sternum in the thorax.

## MCQs

1. the space between 2 arches from outside is called:
  - a. pouch
  - b. cleft
  - c. nodule
  - d. inter-arch
2. each arch is covered externally by:
  - a. mesoderm
  - b. endoderm
  - c. ectoderm
  - d. membrane
3. When does the thyroid gland takes its final shape & position:
  - a. day seventy
  - b. day sixty
  - c. day fifty
  - d. day forty
4. "If" the distal part of the thyroid duct persisted this will lead to the formation of:
  - a. Levator glandulae thyroidae
  - b. Anomally
  - c. Fibroses of duct
  - d. Pyramidal lobe
5. Most thyroglossal duct cysts are located in:
  - a. Inferiorly to the hyoid
  - b. Inferiorly to the styloid
  - c. Superiorly to the styloid
  - d. Anteriorly to the hyoid
6. Arrested descending of the thyroid gland indicates which of the following anomalies:
  - a. Ectopic thyroid gland.
  - b. Congenital hypothyroidism.
  - c. Agenesis of the thyroid gland.
  - d. Persistence of thyroglossal duct.
7. Which part of the pharyngeal pouches forms the inferior parathyroid bud:
  - a. Dorsal 3<sup>rd</sup>
  - b. Dorsal 4<sup>th</sup>
  - c. Ventra 3<sup>rd</sup>
  - d. Ventral 4<sup>th</sup>
8. As the thymus primordium develops, it descends downward to the thorax fixes the .....  
In the right normal position:
  - a. Superior parathyroid
  - b. Inferior parathyroid
  - c. Aorta
  - d. Trachea
9. Development of the parathyroid glands starts in the:
  - a. Day fifty
  - b. 6<sup>th</sup> week
  - c. Day seventy
  - d. 4<sup>th</sup> week

### The answers:

1:b , 2:c , 3:c , 4:d , 5:a , 6:a , 7:a , 8:b , 9:b